Appendix A - Additional Issues

A.1 Private Property/Aesthetics/Safety

Issue - Comments that cattle fences (and other appurtenances such as cattle guards, loading ramps, corrals, and water troughs) are unsightly and poorly maintained. That the cattle often get out of the designated area causing damage to private property and riparian areas, and pose a risk to vehicles on the road. The permit holder should hire a full time herder to keep cattle in designated area and maintain fences.

The question of aesthetics is a personal matter (cattle fences are a very common site in the western states and are not out of the ordinary). Most of the fences have recently been replaced with new materials within the last 2 years and are in excellent condition. If cattle are causing damage to private lands then the land owners need to fence off their land (as most people have already done in this area) (project file, doc. #E-13). Since the fences are well maintained there is no need for a herder to be present on the allotment full time. Alternative 3 and 4 are designed to keep the livestock within the allotments so there is no need for a full time herder.

As for cattle getting out of designated areas and causing damage in riparian areas (more specifically in a area next to Watkins Creek and Road #167, and the toad breeding exclosure); based on field observations in 2010 the small triangle next the Watkins Creek had no signs of cow manure, trails, hoof prints or browse (project file, doc. #E-5) . As for cattle being in the toad breeding exclosure, this was designed to keep ATVs out of the exclosure and not cattle. Impacts to toads are discussed in pages 3-16 to 3-20.

As for large animals being on the road and causing a safety hazard to vehicles, signs have been posted on the Denny Creek Road # 167 to warn drivers that this is "Open Range. " Drivers still need to use caution because there are other large animals on the road (moose, elk, bear, and people).

A.2 Cultural Resources/Archeological Sites

Issue – There was a concern that installation of a water trough or new fence may have a detrimental impact to cultural resources.

Previous surveys in this area have not located evidence of historical sites within the allotments. The mitigation measure that requires an additional site survey prior to any ground disturbance and modification to the project design if a site is located (EA, p. 2-10) will eliminate any affects and concerns.

A.3 Greenhouse Gasses/ Global Warming

Issue - Concern that ruminant animals (such as cattle and bison) contribute to greenhouse gasses (GHG) and global warming.

Analysis Methodology

This issue was investigated via literature review to get more information on the context of the issue.

Affected Environment

Naturally occurring greenhouse gases include water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and ozone (O3). The EPA 2009 U.S. Greenhouse Gas Inventory Report at http://www.epa.gov/climatechange/emissions/usinventoryreport.html concludes that methane (CH4) is more than 20 times as effective as CO2 at trapping heat in the atmosphere. The United Nations Food and Agriculture Organization (FAO), estimates that 7,516 million metric tons per year of CO2 equivalents (CO2e), or 18 percent of annual worldwide GHG emissions, are attributable to cattle, buffalo, sheep, goats, camels, horses, pigs, and poultry. Goodland (2009) submits that livestock and their byproducts actually account for at least 32,564 million tons of CO2 per year, or 51 percent of annual worldwide GHG emissions. EPA 2009 reports that over the last two hundred and fifty years, the concentration of CH4 in the atmosphere increased by 148 percent. Manure management is a substantial source of CH4.

Direct and Indirect Effects and Cumulative Effects

The Watkins Creek Allotment involves 55 cow/calf pairs and the South Fork Allotment can contain 15 cow/calf pairs, both allotments can be stocked from July 1 to September 30. Cattle can emit greenhouse gasses from enteric fermentation and manure. Estimates of yearly methane production from the typical beef cow ranges from 60 to 71 kg (Johnson and Johnson, 1995), so seventy cow/calf pairs may produce 4200 kg to 4970 kg of methane per year.

The No Grazing Alternative may have the least amount of greenhouse gas emissions since no livestock would be permitted on the allotments. However, the cows would likely just continue grazing on private land so there is no net decrease in gas emissions. The current management and proposed action would have approximately equal amounts of greenhouse gas emissions. These emissions, however, are at such a minor scale that the direct effects would be meaningless to a reasoned choice among alternatives. Plus, this project is not increasing or decreasing the number of cows grazing in Montana. Even the No Grazing Alternative will only result in the cows grazing on private land and will not result in a decrease in cows.

Because greenhouse gases mix readily into the global pool of greenhouse gases, it is not currently possible to ascertain the indirect effects of emissions from single or multiple sources. Because the South Fork and Watkins Creek Allotments are extremely small in the global atmospheric CO2 context, it is not presently possible to conduct quantitative analysis of actual climate change effects. Greenhouse gas emissions from South Fork and Watkins Creek Allotments are extremely small compared to the orders of magnitude for larger feedlots and agricultural concentration areas cited in the EPA 2009 report and Hao *et.al*. 2001. The US Forest Service does not have an accepted tool for analyzing GHG emissions. As GHG emissions are integrated across the global atmosphere, it is not possible to accurately determine the cumulative impact on global climate from emissions associated with cattle grazing on the South Fork and Watkins Creek Allotments. It is not expected that such disclosure would provide a practical or meaningful effects analysis for selection between the different alternatives. The measureable effects on climate change caused by the South Fork and Watkins Creek Allotments, given

the context of and the very minor effects; cannot be meaningfully evaluated under current science, modeling, and policies.

Comparison to Laws, Regulations, and Forest Plan Direction -

It is not currently feasible to reasonably determine the magnitude of effects from the South Fork and Watkins Creek Allotments project on greenhouse gases directly, and therefore climate change indirectly, as there are currently no Federal statutes, regulatory standards, or policy directions on the allowable amounts of greenhouse gas from livestock. Until meaningful, accepted thresholds are adopted against which to weigh any project-related GHG emissions, it will not be possible to determine whether South Fork and Watkins Creek Allotments specific project will have a measurable effect on global warming.

A.4 Other Wildlife Species

Many wildlife species inhabit the Hebgen Basin and the areas included within the South Fork and Watkins Creek Allotments. Many wildlife concerns have been addressed in the Management Indicator Species (MIS), Sensitive Species, Migratory Bird and Threatened and Endangered Species Reports. During the scoping process the public has raised additional concerns on various wildlife issues. These issues are summarized as follows:

Issue - There is concern that livestock grazing and the associated infrastructure on the Watkins Creek and South Fork Allotments would cause habitat fragmentation and impede wildlife movement within migration corridors. The main concern raised by the public during the scoping process was the impact of grazing on wildlife movement and habitat fragmentation, specifically moose, bighorn sheep, antelope, mule deer, and elk. There was also concerned about osprey, swans, reptiles and amphibians.

Discussion -No bighorn sheep occur within the Watkins Creek and South Fork Allotments. Therefore, an impact to this species is not discussed further.

Affected Environment

Elk and Swans - Effects to elk and trumpeter swans are discussed in detail in the MIS and Sensitive Species reports, respectively (EA, p. 3-59 to 3-66).

Osprey - There are no known nests within South Fork Allotment. There is one known nest in the Watkins Creek Allotment (the nest is located in a forested area not utilized by cattle). Ospreys in the Hebgen Basin exhibit a high tolerance for human disturbance. Ospreys forage exclusively on live fish over lakes and streams. The osprey nest within the allotment is not disturbed by cattle and ospreys do not compete with cattle for food. Therefore, this species is not discussed further.

Reptiles and Amphibians - The fences found on the Watkins Creek and South Fork Allotments are permeable to any reptile or amphibian species found in the Hebgen Basin. These fences are four strand barbed wire fences and not a barrier to reptile movement. There would be no impact from fences on any reptile species in the area. Additional analysis of amphibians is found on pages 3-16 to 3-20 of this EA.

Habitat Fragmentation and Migration Corridors - There are a number of definitions for corridors, and the term corridors, connectivity, linkage, and linkage zones, are sometimes used interchangeably. For this issue, we consider corridors to be habitat areas that are historical connections, for the species of interest, which allow those species to access one or more habitat parameters necessary for food, cover (hiding, thermal, loafing), water, breeding or wintering habitat. These connections are important to maintain the natural use patterns of different wildlife species on the landscape. For this analysis, fragmentation will be considered any activity or change in habitat that would prevent (permanently or temporarily) access to one or more of the above mentioned habitat components.

The Watkins Creek and South Fork Allotments are within the Hebgen Basin. Although animals move throughout the Hebgen Basin between Yellowstone National Park and the Madison Valley, there are no specific known movement corridors. On a larger scale, animals may move through Hebgen Basin from the Greater Yellowstone Ecosystem to mountain ranges and valleys further to the west in Montana and Idaho.

The main risk factors for wildlife movement through biological corridors are obstacles to movement such as roads, especially high-speed, paved roads such as highways (Forman et al. 2003, p. 130-133), as well as land ownership patterns and urban development.

U.S. Highway 191 is located approximately six miles east of the South Fork Allotment and probably has greater effects on animal movement in the Hebgen Basin area than almost any other man-made feature.

Of additional concern are land ownership patterns and human developments. The ability of many large wildlife species to move across and within the Madison Range is affected by development of private lands found along the South Fork River. Currently, the development in this area is relatively minor, characterized by small ranches around the South Fork River and Denny Creek Road.

On National Forest lands, the density of motorized routes (typically low maintenance unpaved roads and trails) can also be a factor affecting the movement of animals across the land. Changes in habitat are usually not as critical unless hiding cover is removed for those species that need cover for movement. Continuation of livestock grazing will have no impact on animal movement since cover removal or road changes are not proposed in any of the alternatives.

Fences are necessary for managing livestock within grazing allotments, but may also restrict wildlife movements, depending on the location and type of fence, as well as consideration of the wildlife species which use the area. Some species (primarily pronghorns) are not adapted to crossing obstacles like fences. Fences are often major barriers to movement for pronghorn. However, few pronghorn are found on the South Fork allotment and no pronghorn are known to use the Watkins Creek Allotment. The habitat in the Hebgen Basin is marginal for pronghorn since it is physically separated from larger, contiguous tracts of suitable pronghorn habitat in the Madison Valley. This separation is caused by extensive forested areas that pronghorn tend to avoid. Pronghorn presence in this area is sporadic and does not occur every year.

Mule deer, moose and elk on the allotment have the ability to negotiate fences by jumping, or by crawling underneath or through them. In cases where fences that are not designed to allow safe wildlife passage, they may change the pattern of wildlife movements.

All fences on the Watkins Creek and South Fork Allotments are 4-strand barbed wire fences meeting Forest Service standards for cattle allotments. These fences are designed to allow larger animals such as elk, deer, and moose to negotiate them unimpeded, but have enough space beneath the lowest strand or between the wires to allow smaller animals to safely crawl under or through them. Evidence of deer and elk tracks observed in the snow show that these species have no problem in negotiating fences in the basin through the winter. Additionally, many fences associated with the grazing allotments are dropped in the winter to further for unimpeded wildlife movements. As a result, existing or proposed fences would have little effect on wildlife movement within the Watkins Creek and South Fork Allotments under any alternative.

This issue can be eliminated from further analysis for the following reasons:

1) Cattle are removed prior to migration and the fences are dropped to facilitate big game passage.
2) Remaining fences are four-strand, barbed wire ungulates can jump over or crawl through or under.

Mule Deer - Mule deer, along with smaller numbers of white-tailed deer, occur throughout the South Fork Allotment during the summer months. Only mule deer use the Watkins Creek Allotment. There is no winter range for either species on either allotment.

Deer and cattle generally differ in forage preferences and how they use the landscape. Cattle prefer grass or grass like plants. Studies of mule deer in the Bridger Mountains on the north end of the Forest found that emerging grasses were important very early in the spring, forbs dominated the summer diet, and the use of shrubs gradually increased from late summer to late winter (Pac et al. 1991, p. 91). This study concluded that the current pattern of livestock grazing did not appear to have a significant impact on habitat values for mule deer. Hamlin et al. (1989, p. 264, 276), in another Montana study, also found the greatest dietary overlap to be in April and May but found little overlap in the primary use areas of the two species. He did not find any evidence that mule deer populations were adversely affected by cattle.

Mule deer and cattle also use the landscape differently (Mackie et al. 1998, p. 138). Cattle tend to concentrate and use open grasslands, open ridge tops, and riparian areas with low to moderate slopes -- a relatively small portion of mountain landscapes. Mule deer are solitary (as individuals or in small family groups), widely dispersed, and utilize a greater amount of forest, steeper slopes, and areas less accessible (Mackie, 1985, p. 51-55). Ganskopp and Vavra (1987, p. 77) found that habitat avoidance for cattle included slopes steeper than 20% slope, compared to 40% by mule deer.

There is some potential for livestock to adversely impact mule deer through forage competition in riparian zones where cattle tend to concentrate. Cattle can damage riparian woody vegetation by both

browsing and breaking/trampling (Kovalchik and Elmore 1992, p.114; Clary and Webster 1989, p.2). This may affect the availability of browse for wintering mule deer. The effects of this on deer depends on the amount and extent of cattle overuse in riparian zones, the location and extent of deer winter range, and the availability of alternate browse sources for deer. There is relatively little overuse in riparian areas on these allotments and no deer winter range; therefore little or no effect on mule deer.

Moose - Both allotments provide year-round habitat for moose. Moose are a native big game species that are important to the public for a variety of reasons such as wildlife viewing and hunting. There are no systematic population counts for moose in the Hebgen Basin area. However, there are numerous indications that moose numbers in this area have been declining for approximately 15-20 years (J. Cunningham, FWP, personal communication, 09/26/10).

Moose are characterized as "concentrate selectors". They seek out food resources where large biomasses of forage are clumped or concentrated. These clumps are often widely dispersed in the environment. To contend with this, the moose is physically adapted to travel between clumps, often in environments where snow or water are an impediment to travel (Reneker and Hudson 1992, p.61).

Throughout their range in North America, moose browse deciduous shrubs. In many areas, concentrations of these shrubs are found in riparian areas or in early seral habitats. Riparian areas have high water tables that allow for this type of vegetation. Also, a proliferation of shrubs may follow the removal of forest overstory because of the reduction of competition for light and water that result. As a consequence, many managers associate moose with these two habitats (Pierce 1984, p. 2404).

However, understanding the diet of a moose population is more complex than identifying the location of willow communities and/or areas where there has been a recent disturbance. Moose selection of winter habitat and diet can be highly variable between regions and years. This probably reflects adaptive responses to different environmental conditions. Peek (1974a, p. 134) cautioned against making unequivocal generalizations about moose winter habitat selection and suggests that the amount of variability can make such generalizations misleading. The influence of snow conditions and the presence or absence of alternate food sources are also important variables to consider.

Peek (1974*b,* p. 195) reported on the variability in the winter habitat and diet selected by moose in North America. He reviewed 41 different reports; 13 from the intermountain west. His review highlighted the fact that there is significant variation as well as important points of commonality in diet and successional stage used by moose in different geographic areas.

In another document (Peek 1974*a,* p. 134), he focused on just the Shiras moose. This subspecies occupies the intermountain west. He identified 5 different types of winter habitat. Willow and other forms of deciduous riparian vegetation have varying degrees of importance in the respective types.

1. Willow bottom/stream/conifer complex occurring along high gradient streams.
2. Floodplain riparian community containing extensive willow stands.

3. Drainage where willow bottom communities are very limited and are of little importance to moose. Conifer and aspen types are important and the diet is more varied than in areas where willow is plentiful.
4. Arid juniper hills.
5. Willow bottoms that are important but are neither limited nor extensive. Moose are forced from these by snow conditions to adjacent forest slopes where subalpine fir stands support low density moose populations in winter.

Types 1, 2, 3, and 5 can all be found in southwest Montana (Stone 1971, p. 61-62; Dorn 1970, p. 560-562; Peek 1974*a,* p. 133). The work of several researchers specifically documents the existence of type 5 in the Greater Yellowstone Area (GYA).

Loope and Gruell (1973, p. 436-437) hypothesized that old forests are critical to moose in the GYA and that moose have increased here with fire suppression and the aging of forests. In their opinion, the very low moose population in the GYA during the 19th century was because fires maintained early successional vegetation. A primary factor in this appears to be an increase in shade tolerant subalpine fir in late successional stage forests; a species they thought might be the staple food item in the diets of the moose of the GYA. That hypothesis was tested in a study on the Northern Yellowstone Winter Range. It was demonstrated that moose spent the early part of the winter in willow areas but then retreated upslope into older forests as snow conditions made travel in the open more difficult. Subalpine fir was identified as the most used food item. Willow was second. Subalpine fir was especially important comparatively because of its use in the hardest months of the winter (Tyers 1994, p. 1-3).

Given the documented variability in the diet and habitat selection of moose, the assessment of moose habitat in the intermountain west by Peek and Loope and Gruell, and the results of local research, it needs to be recognized that moose of southwest Montana are distinct. Although willow is an important browse species here, many populations are not as tied to vegetation in riparian areas and early seral stages as moose in other regions. During the time period when cattle are present, moose tend to occupy higher elevations within the Watkins Creek Allotment, so competition is absent.

On the Watkins Creek and South Fork Allotments, there are willow communities in riparian zones along the South Fork of the Madison River, Watkins Creek and the shoreline along Hebgen Lake. Snow conditions are such that willow communities in the lower elevation portions of the allotment are generally available to moose throughout the winter, but those in the upper elevations may sometimes be unavailable to moose due to deep snow. Old conifer stands with a subalpine fir component are commonly present as well, and are important to moose on the allotment during winter. This habitat type is found within the Watkins allotment.

In areas where moose and willow occur together and snow does not restrict access, the willow areas are important. If few other winter food types are available, the presence of deciduous vegetation is critical. In these cases, (if livestock can reach the willow areas as well) the influence of livestock on deciduous vegetation is important. Livestock are attracted to riparian areas for a variety of reasons: succulent

forage, shade, and availability of water. Livestock grazing may cause damage to herbaceous vegetation, woody vegetation, and the riparian system as a whole. Specifically, riparian vegetation can be damaged by rubbing effects, trampling, and browsing. In addition, regeneration of deciduous species may be hampered (Olson and Hubert 1994, p. 22).

This issue can be eliminated from further analysis because:

1. The literature indicates there is low potential for forage competition between cattle, elk and deer on summer range.
2. No deer or elk winter range is present within the Watkins Creek and South Fork allotments.
3. Moose tend to occupy higher elevations during the cattle grazing period thereby eliminating competition with cattle. Current and proposed levels of grazing have not, overall, impacted riparian communities with the allotments (EA, p. 3-27 to 3-34).

Displacement of Wildlife by Cattle

Although some researchers note cattle and elk or deer feeding in proximity to one another, the consensus is that elk and deer avoid areas currently being occupied, or recently grazed, by cattle (Mackie 1970, p. 73; Coe et al. 2001, p. 205).

One area not addressed by this research is how much of the apparent elk and deer avoidance of active allotments is social intolerance and how much is related to different habitat preferences. Some research indicates elk and deer move to different habitats for succulent forage, security, and thermoregulation in the absence of cattle (Edge et al. 1988, p. 576; Leege 1984, p. 3). Not only are elk and deer physically better adapted for traveling longer distances to a water source, they are also able to make use of steeper slopes and rougher terrain than cattle. As Hoskins and Dalke (1955, p. 223) stated, "although cattle and elk were frequently seen feeding in the same aspen groves, the elk tended to use the higher and steeper slopes." Lyon (1985, p. 18) reported that spatial competition was limited by the greater mobility of elk, their tendency to use steeper slopes than cattle, and their ability to utilize areas further from water. Mackie et al. (1998, p. 138) found that mule deer preferred more rugged terrain than cattle. Cattle generally use bottoms, flats, and gentle slopes (Julander and Jefferey 1964, p. 412; Mackie 1970, p. 49).

The timing of turning cattle on to the allotment is an effective method of preventing potential detrimental effects to elk and deer through displacement. The area provides some calving and fawning habitat for elk and deer. Cattle are not turned out on the allotments until early July, which is well after calving and fawning are over. Cattle are scheduled to vacate the allotments at the end of September, and since snow depth limits use of this area for winter range, there is no displacement of elk from winter range. Therefore, potential displacement of elk and deer from some of the most important seasonal habitats has been and would continue to be effectively mitigated under all alternatives.

Even if it occurred, avoidance of cattle by elk and deer would not be detrimental to them unless this displacement prevented them from obtaining a resource which they could not otherwise

obtain. Some researchers indicate this displacement works toward an overall greater efficiency in rangeland use (Alt et al. 1992, p. 15; Stevens 1966, p. 361), especially in locales where extensive summer range limits the potential for spatial competition (Hoskins and Dalke 1955, p. 222). This is the case on the Watkins Creek Allotment, where the entire allotment provides good elk and deer summer range. Radio telemetry data collected by Montana Fish Wildlife and Parks indicate some elk spend the entire summer and fall within the Watkins Creek Allotment (J. Cunningham, personal communication. 2011). Population trends for these elk are increasing, giving reassurance that the nutritional plane for elk is sufficient.

Demographic data for mule deer populations in the project area are not collected like they are for elk. However, a long-term study of mule deer in the Bridger Mountains of southwest Montana found that fawn survival is the most important factor limiting mule deer populations in this part of the state. The ecology of mule deer in the Bridger Mountains study demonstrated that a variety of factors influenced fawn survival, but some of the most important were winter severity, predation, and forage quality as related to the length of time forage plants were green during the summer (Mackie et al. 1998, p. 100-103). These factors would affect deer populations largely independent of social displacement by cattle.

The issue of social displacement of elk and deer by cattle on the Watkins Creek and South Fork Allotments can be dismissed because:

1. Turn-out and removal dates would effectively mitigate the potential for displacement of elk and deer from important calving/fawning and winter ranges.
2. Increasing population trends for local elk populations indicates that displacement from summer habitat by cattle had not affected the nutritional plane for elk.
3. The available evidence indicates that the factors controlling deer populations on the allotment would not be influenced by social displacement of deer by cattle.
4. Nothing proposed in any of the alternatives would affect the way deer and elk currently use the area.

A.5 Migratory Birds / Brown-headed Cow Birds

Migratory birds are a very diverse group, which includes raptors, waterfowl, shore birds, and songbirds. Migratory bird species are protected under the Migratory Bird Treaty Act (16 USC 703-711). Executive Order 13186 requires agencies to ensure that environmental analyses evaluate the effects of federal actions and agency plans on migratory birds, with emphasis on species of concern. The Montana Natural Heritage Program 2010 "Species of Concern" list was used to identify focal species for this analysis.

Many of the Heritage species of concern are addressed in separate reports for sensitive species and management indicator species (bald eagle, trumpeter swan, harlequin duck, peregrine falcon, northern goshawk, black-backed woodpecker, and flammulated owl). The species of concern identified for this report (great gray owl, olive-sided flycatcher, and Swainson's hawk) are generally associated with open

forest, including burned forest, and grass/shrub types. Of these, the great gray owl is not a neotropical migrant, in that it does not migrate to the tropics, but there is some movement between the US and Canada.

Sage grouse are listed as a state species of concern. They are a sensitive species for some forests in Region 1, but not even "known" to occur on the Gallatin (Regional Forester's Sensitive Species List, updated in 2011). In general sage grouse select large, contiguous sage brush habitats for various aspects of their life history with variable sage brush height and canopy coverage (depending on time of year). The literature suggests that sagebrush patches greater than 213 acres at lower elevations can support sage grouse populations. Vegetation data for the Gallatin National Forest indicates that out of the 44,285 total acres of total sagebrush, there are only 3 polygons of sagebrush habitat greater than 200 acres and under 6000 ft elevation (project file, doc. #L-5). None of those patches occur on the Hebgen Lake Ranger District. There are no documented sightings of sage grouse on the Gallatin National Forest based on the Montana Heritage database. Therefore, sage grouse are not considered in this analysis.

Issue **–** Cattle grazing may impact nesting habitat and may reduce grass/forbs cover and affect prey abundance for predatory species.

Indicator **–** Determine if grazing alters habitat required for bird (breeding, brood rearing and fledgling).

Method for Analysis

The habitat requirements for these birds were determined using a Cornell University online database and compared to the condition on South Fork and Watkins Creek Allotments. If species habitat was not found within the allotments, that species was not analyzed in detail. If habitat for a species is present in the area, literature was reviewed to determine if grazing at the levels proposed would have a detrimental impact on habitat or prey species habitat.

The Montana Natural Heritage Database, along with direct field observations, was used in addition to the habitat analysis, to determine presence/absence for various species.

Table A-1. Reproductive timing for species of concern possibly occurring in the project area.

Species	Courtship	Nest building	Incubation	Brood rearing	Fledging
Great gray owl	January-April	March -April	Early May, 29 days	21-28 days	Early June
Olive-sided flycatcher	Late May to early June	Early to mid June	14 days	19-21 days	Late July
Swainson's hawk	April	Mid to late April	28 days	21 days	Late June
Brewer's sparrow	Late April-early May	Mid-late May	10 – 12 days	6-9 days	Mid-June

*Information provided in this table was obtained from Cornell Lab of Ornithology Bird's of North American Online.

Great gray owl

Great gray owls select open forest structure for nesting, and often hunt in open meadows. Foraging habitat consists of relatively open, grassy areas including natural meadows, logged areas and open forest (Bull et al., 1993, BNA Online). Great gray owls typically nest in the more open structure associated with relatively dry, montane coniferous or deciduous forests. Nest sites are generally located in close proximity to open areas used for hunting (Duncan and Hayward 1994, p. 164). Great gray owls have been observed in the project area with possible breeding activity. Additional information on reproductive activity can be found in Table A-1.

Conclusion: This project does not involve manipulation of forested habitats and would not impact reproductive activity of this species. Cattle grazing has been identified as a threat in California by reducing prey populations (Bull, et al., 1993, BNA online), although exactly how it affects prey populations was not identified. Grazing pressure is light to moderate (12-68%) on these allotments. At that level, it would not be expected to affect vole populations, the primary food item for great gray owls. Additionally, the home range of great gray owls is estimated at >16,000 ac., so they have the ability to search large areas for prey. Great gray owls, if they breed in this area, have fledged prior to livestock turn-on. Therefore, great gray owls are not further analyzed.

Olive-sided flycatcher

Olive-sided flycatchers are strongly associated with recently burned forest, but are also relatively common in logged areas, including clear-cuts and partial harvest treatments (Hutto and Young, 1999:25). While olive-sided flycatchers appear to do well in timber harvest areas, breeding bird surveys have identified significant population declines for this species. This species nests in snags in coniferous forests. The main threat to this species is forestry practices that reduce available snags for reproduction. Additional information on reproductive activity can be found in Table A-1.

Conclusion: This species is a forest dependent species associated with mixed coniferous forests and small forest openings. Grazing activities will not impact foraging. This species forages exclusively on flying insects captured above the forest canopy (Altman and Sallabanks, 2000, BNA Online). Nests tend to be built from varying heights on an extended limb in coniferous trees. Grazing practices will not impact this habitat type. Given its dependence on coniferous forests and snags, as well as its foraging behaviors, this species is not susceptible to disturbance from grazing or infrastructure development and is not analyzed further.

Swainson's hawk

Swainson's hawks select open woodlands, fields and agricultural lands for nesting and hunting. Swainson's hawks typically nest in lowland river bottoms (Montana Fish, Wildlife, & Parks 2006, website accessed 2010) in mature cottonwoods, habitat that is not generally found on National Forest Service lands but occurs in the rural and agricultural land adjacent to the project area. Additional information on reproductive activity can be found in Table A-1.

Swainson's hawks feed on small mammals, birds and insects. They commonly hunt in agricultural fields, and might occasionally enter the project area in search of prey. There have been documented Swainson's hawks in the project area, but there is no suitable nesting habitat. Suitable foraging habitat exists within the project area. Prey items would include subterranean rodents such as pocket gophers and ground squirrels (Bechard et al. 2010, BNA online). Primary threats to Swainson's hawks are organo-chloride pesticide poisoning on wintering grounds in South America and disturbance at nesting sites (Bechard, 2010, BNA Online). This species has adapted well to intensively managed agricultural areas where forage is abundant for prey species (Bechard, 2010, BNA Online.) These agricultural areas are mowed annually and do not impact hawks. Cattle grazing on the Watkins Creek and South Fork Allotments do not mimic intensive agriculture as these allotments are grazed lightly within ample structural vegetation diversity.

Conclusion: Due to the lack of suitable nesting habitat and a grazing intensity that does not denude the allotments (project file, doc. #E-1), there will be no impacts to Swainson's hawks; therefore this species is not analyzed further.

Brewer's Sparrow

Brewer's sparrows are typically found in dry, sagebrush habitats where they forage on a variety of insects and seeds. Foraging occurs in the most vigorous sagebrush stands and very little time is spent in open areas. Nesting occurs late April and into May with most chicks fledged by mid-late June. Additional information on reproductive activity can be found in Table A-1. Brewer's sparrows breed throughout the Great Basin and other sagebrush habitats throughout the central and northern Rocky Mountains. Wintering habitat includes dry, brush covered landscapes from the desert southwest, south into central Mexico and the Baja peninsula. Degradation of rangelands and conversion to agriculture has fragmented sparrow habitat (Rotenberry, et al, 1999) along with invasion of shrublands by non-native grasses such as cheatgrass (*Bromus tectorum*). Walker (2004) recommends maintaining sagebrush stands with 10-30% shrub cover with native grasses and forbs.

Brewer's sparrows have been documented in the project area during the summer season (MT Natural Heritage Database, accessed 2011). For Brewer's sparrows nesting in the project area, fledgling should occur by mid-June, so egg laying and incubation would be completed prior to cattle occupying the allotments. The sagebrush habitat in the South Fork and Watkins Creek Allotments has not been damaged by overgrazing providing suitable nesting habitat (project file, doc. #E-1). Human disturbance at nesting sites can disrupt breeding behavior or result in adults being flushed from nests. Because sagebrush habitat has not been damaged by grazing, and fledging is complete before livestock are released onto the allotments, this species is not further analyzed.

Migratory songbirds other than Species of Concern

The Gallatin National Forest provides breeding habitat for dozens of migratory bird species. This extremely diverse group occupies all types of habitat in the project area, including ponds, streams, wetlands, riparian areas, grasslands, shrub lands, deciduous forest, coniferous forest, mixed forest, recently burned forest, and rock outcrops. Forested habitats provide trees, shrubs, snags, and surface

vegetation for nesting birds. Open meadows provide habitat for ground nesters and shrub/foliage nesters.

Portions of the Hebgen Lake shoreline and the associated tributaries provide riparian habitat for a wide variety of birds. Cliffs and rock outcrops in the project area provide ledges, cracks and crevices as nesting areas for a number of bird species. Forage is abundant in the project area with birds, small mammals, fish and invertebrates providing prey species for many birds. Seeds, berries and other vegetative food sources are also abundant.

Bock et al. (1993, p. 296-309) summarized research evaluating impacts to migratory bird species from grazing. The summary was separated by habitat type and included grasslands, riparian, shrub-steppe and montane coniferous forests. Table A-2 summarizes the research findings.

Table A-2. Responses of number of migratory songbird species to grazing impacts in various habitat types in the Western U.S.

	Grasslands	**Riparian**	**Shrub-Steppe**	**Montane Coniferous***
Positive	9	8	3	-
Negative	8	17	13	-
Mixed or uncertain	8	18	7	-

*The authors noted there were not enough studies available to draw conclusions about grazing impacts to songbirds in montane coniferous forests.

Effects Analysis

Alternative 2 (Current Management), Alternative 3 (Proposed Action) and Alternative 4 (Modified Proposed Action) would all have similar impacts from disturbance and habitat alteration related to grazing operations. Alternative 1 (No Grazing) would eventually result in conditions where there would be no impact from livestock grazing on songbirds.

Cattle grazing and the associated infrastructure can have various effects on migratory birds. Habitat modification can alter the quality and quantity of habitat available for migratory bird species. While habitat alteration may have adverse impacts to some bird species, other species demonstrate a positive response. Those effects can vary by class of livestock, grazing intensity, timing and duration, bird species and habitat type. The grazing season starts after the peak of the songbird breeding season so direct effects (i.e. nest trampling, chick mortality) from livestock would not be an issue. If cool spring results in delayed plant growth, the cattle turn-on date will also be delayed (based on range readiness monitoring). Indirect effects from cattle grazing could be manifested as alteration of habitat quality or quantity that could affect availability of habitat.

Livestock management such as the use of heavy machinery or off-highway vehicles to move cattle or develop infrastructure (such as water developments) could disrupt foraging behavior and/or destroy nests. These impacts could occur during the breeding season prior to turn out.

Direct Effects

Spring is the critical breeding time for migratory birds. Pair formation, nest construction, egg-laying, brooding and nestling care occurs for most species during the period from about the end of March through mid-July.

Human disturbance associated with fence removal, fence repair, and infrastructure development could elicit behavioral responses from birds which can in turn affect reproductive success and survival. Disturbance during the nesting season could cause reduced parental care and/or nest abandonment. Disturbance outside the breeding season could influence a bird's foraging behavior and energy balance, and consequently affect survival rates. Birds may change nest locations in response to human disturbance. Alternate nest sites may be less suitable in terms of security and thermal cover, availability of foraging habitat, perch sites, and other important habitat components (Knight and Gutzwiller 1995:52, p. 55, 73).

Throughout most of the USDA Forest Service's Northern Region, young birds have fledged, and the breeding season surveys are completed by mid-July (Hutto and Young, 1999, p. 3). Turn out date for the allotments, is July 1st, which is late in the breeding season for most species. Most ground nesting birds have fledged young by this time, so effects would be mitigated by the late cattle turn on date. Turn on dates of livestock can be modified in the annual operating plan to provide a buffer in those years when weather delays the onset of migratory bird occupation of breeding habitats (e.g. from July 1 to July 15. When range readiness surveys indicate a delayed in plant growth the livestock turn-on date will be latter in the season which will reduce impact to latter breeding season (EA, p. 2-11).

Indirect Effects

Cattle utilization levels in both the Watkins Creek and South Fork Allotments are characterized as low to moderate. Therefore, there is some potential for foraging and nesting habitat for migratory songbirds to be impacted, but not to an extent that local populations would be affected. For example, Walker (2004, online reference) noted that in light to moderately grazed areas, Brewer's sparrows were found in higher densities but in areas where sagebrush was removed, the sparrows were absent. Alternatives 3 and 4 provide measures to protect and improve riparian habitats which could provide a minor benefit to some species of migratory birds.

Cumulative Effects

Cumulative effects are those past, present and reasonably foreseeable actions, both private and public, that, in conjunction with the effects of the proposed actions, may be additive. Habitat alteration is not proposed under any alternative. Some level of human activity will be associated with implementation of any alternative. Those past, present, and reasonably foreseeable activities occurring in the project area that could have cumulative effects are those that entail additional human activity, especially if those activities occur during the breeding season.

Current and future activities such as camping, road and trail use, thinning and prescribed fire, and grazing on private land could affect migratory birds. Of these, only human disturbances have the potential to be cumulative in conjunction with the grazing effects. Ample habitat is available for birds that tend to have short flush distances. The disturbance is usually of short duration and intensity resulting in impacts that are not significant. For example, Rotenberry et al (1999) noted that Brewer's sparrows were tolerant of human disturbance around nests, even on a daily basis.

Spatial Boundary -Timber compartments (TC) 709 and 710 are defined as the spatial boundary for this analysis. The South Fork and Watkins Creek Allotments are included entirely within the selected TCs. The project area consists of a wide array of habitat types and elevation gradients that would support a diverse avian community.

Temporal Boundary - The temporal boundary is defined as the 10 years past and 10 years present. Ten years is the length of the grazing permit and the timeframe that impacts from human disturbance associated with this permit would occur regularly and predictably.

Consistency with laws, Policy and Regulation

Executive Order 13186. This order ensures federal agency compliance with the Migratory Bird Treaty Act focusing on species of concern. Due to the timing of this project (turn out on July 1st), direct mortality is not expected. Some disturbance to migratory birds and avian species of concern could occur as a result of human activities associated with infrastructure maintenance, removal or construction.

Memorandum of Understanding between the U.S. Department of Agriculture and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds (2008). This MOU outlines a collaborative approach to promote the conservation and reduce the take of migratory birds. The Forest Service commits to evaluating the effects of agency actions on migratory birds, focusing on species of management concern. To the extent practicable, the Forest Service commits to pursuing opportunities to restore or enhance habitats of migratory birds and to alter the season of activities to minimize disturbances during the breeding season. Alternative 3 includes the protection and improvement of existing riparian areas. Turn on dates of livestock can be modified in the annual operating plan to provide a buffer in those years when weather delays the onset of migratory bird occupation of breeding habitats (e.g. from July 1 to July 15).

Summary

Project actions that are implemented during the breeding season have the potential to disturb migratory bird species in the activity area. Because livestock turn on dates are flexible, and the turn-on date in the permit is generally outside of the breeding season (July 1), these effects can be mitigated.

Brown-headed Cowbirds

Issue - During the scoping process, the concern was raised that domestic livestock grazing on the Watkins Creek and South Fork Allotments would facilitate nest parasitism from brown-headed cowbirds, thereby reducing productivity of some native bird species.

Discussion - Brood parasites are birds that lay their eggs in the nests of other species, leaving the host species to rear their young. Obligate brood parasites are those species incapable of building their own nest, and so must depend upon other species to hatch and raise their young (Ehrlich et al. 1988:287,289). The brown-headed cowbird (*Molothrus ater*) is an obligate brood parasite that is strongly associated with domestic livestock, particularly cattle, hence the name. Cowbirds are omnivores that feed primarily on insects and seeds. They typically forage on the ground in areas with short vegetation. Livestock provide cowbird foraging opportunities by flushing insects when grazing, producing a food source in manure and body parasites, and increasing insect abundance and visibility in grazed areas (Goguen and Mathews 1999: 10-11).

Cowbirds are widespread across North America, but are most abundant around the Great Plains region. Historically, cowbirds were associated with the American bison (*Bison bison*) on the Great Plains. It is believed that the Great Plains area forms the historic distribution center for cowbirds and that expansion of the species to the west, east and south has occurred fairly recently (Robinson 1999: 4). Their recent appearance in western states has been attributed to the spread of human land uses, particularly agriculture and livestock. Cowbirds are now fairly common in south-central Montana, where landscapes are characterized as relatively dry, sparse forest with wide agricultural valleys (Young and Hutto 1999: 41,45). Chase and Cruz (1999:89) suggest that cowbirds were historically present in the Rocky Mountains where they were originally associated with mountain bison (*B. b. athabascae*). As bison were extirpated from much of the landscape, cowbirds readily adapted to their replacement with domestic livestock. Cowbirds are still associated with native ungulates including bison where they occur, as well as large herds of elk (*Cervus elaphus*). In addition to cattle, cowbirds are regularly found with sheep, horses and other domestic animals (Goguen and Mathews 1999:10-11).

Many authors note the importance of livestock and associated cowbird impacts on migratory songbirds in riparian habitat (Saab et al. 1995: 329; Young et al. 2001:20; Dobkin et al. 1998: 215; Robinson 1999:6; Goguen and Mathews 1999:12; Tewksbury et al. 1999:27; Young and Hutto 1999:51). Concern for riparian habitat is based on a number of factors. Riparian habitats support high densities of cowbird host species, riparian bottom land is generally in close proximity to agricultural areas where livestock tend to be concentrated during the onset of migratory bird breeding season, many riparian corridors are heavily grazed by livestock, cowbirds are one of the most abundant species detected in riparian habitat, and deciduous riparian vegetation can be relatively easy for cowbirds to locate host nests. All these factors should be carefully considered with respect to livestock management. However, Tewksbury and associates (2002: 181) point out that host species most vulnerable to nest parasitism tend to be highly specialized and extremely habitat limited, suggesting that habitat loss may be a more important factor in population declines of riparian-associated species than nest parasitism.

Nest parasitism is also an issue in other breeding bird habitats. Bock and associates (1992:304) note that the presence of livestock has increased cowbird contact with shrubsteppe-nesting bird species. Brewer's Sparrow is one of the most common species breeding in shrubsteppe habitat (Dobkin 1994: A-28), and is also a known host species for the brown-headed cowbird (J. Young, pers. comm. 2003). The Brewer's sparrow has shown significant population declines range wide in the past few decades (Saab et

al. 1995:322), and is now listed in "Montana Animal Species of Concern" (Montana Natural Heritage Program 2004: 5).

Research in the Midwest has indicated that coniferous forest cover on the landscape can be an important indicator of cowbird presence, with cowbird abundance and nest parasitism rates lower in areas of high conifer cover (Tewksbury et al. 2002:180). Although this relationship may generally hold true for western states at a regional scale, the proportion of coniferous forest has no significant relationship with cowbird abundance at the local scale (Ibid:164). Further, Hochachka and associates (1999: 87) reported that parasitism rates were actually higher in areas of greater conifer coverage in forested habitats west of the Great Plains. Young and Hutto (1999:46) found a negative relationship between cowbirds and forest canopy cover, with cowbirds being more common in open forest types including partially logged areas. Hejl and Young (1999:75) found cowbirds to be more common in mature second-growth forests than in old growth forests. They noted that this could be at least partially due to the closer proximity of most second-growth forest stands to major agricultural areas. Of forest types in Montana, Young and Hutto (1999:45) reported the greatest percentage of cowbird detections in ponderosa pine, a moderate number in Douglas fir, low numbers in mixed conifer and lodgepole pine forest, and only rare detections in other conifer types. Watkins Creek Allotment contains primarily lodgepole pine, mixed conifer, and spruce-fir forests which are marginal habitat for cowbirds. South Fork Allotment is mostly grassland and not forested.

By far, the most frequently cited factor related to cowbird abundance and associated nest parasitization rates in western states is proximity to feeding sites, primarily agricultural areas (Robinson 1999:6; Goguen and Mathews 1999:13; Tewksbury et al. 1999:27; Young and Hutto 1999:49; Hejl and Young 1999:77; Tewksbury et al. 2002:164; Fondell and Ball 2004:212). The Watkins Creek and South Fork Allotments are located within a mountainous wildland landscape rather than an agricultural one. Cowbirds would be less abundant here and therefore less of an issue for breeding birds compared to adjacent valleys where agriculture is a dominant land use.

In Montana, the breeding season for migratory birds is completed by about mid-July (Hutto and Young 1998:8). During normal years, cattle would not be present until July 1. Cowbirds are correlated with the presence of cattle. Turn on dates of livestock can be modified in the annual operating plan to provide a buffer in those years when weather delays the onset of migratory bird occupation of breeding habitats (e.g. from July 1 to July 15). The migratory bird breeding season would be largely completed by the time cattle are turned out. The potential for nest parasitism by cowbirds would therefore be minimal under all alternatives, and this issue can effectively mitigated.

A.6 Sensitive Plants

Issue - There is a concern that grazing may impact sensitive plants inside the allotments. Sensitive plants are rare plants, as defined by the Regional Forester for the Northern Region Forest Service, for which population viability is a concern. All Forest Service planned, funded, executed or permitted programs and activities are to be reviewed for possible effects on sensitive species (FSM 2672.4).

Affected Environment

The following table displays a list of sensitive plant species that may potentially occur on the Gallatin National Forest. The table summarizes the suitable habitat, elevation and the potential that the plant occurs within the project area. Both allotments are between 6,500 to 7000 feet elevation, and contain open bunchgrass habitat, and some open forest. The soils are mostly well drained glacial till (loamy soils) and a limited amount of wet lands (Davis, C. and H. Shovic, 1996. Soil Survey of Gallatin National Forest). If suitable habitat and elevation occurs within the allotments then the field survey emphasized these species during the surveys.

Table A-3 Sensitve Plants Habitat Summary

Plants	Habitat	Elevation (in feet)	Potential Habitat Available? Species Present?
Musk root *Adoxa moschatellina*	forest, moist mossy slopes, rock crevices	4,400-5,400	No – project area is dry and above this elevational range
Small flowered columbine *Aquilegia brevistyla*	open woods and streambanks, limestone sites, northern aspect	5,000-6,000	No – project area is above this elevational range
Large leafed balsamroot *Balsamorhiza macrophylla*	open hills, bunch grass	7,000-8,500	Yes – Surveyed for this species because present in area but none found
Small yellow lady's slipper *Cyoripedium calceolus ver. Parviflorum*	Bogs, damp mossy woods, seeps, moist forest meadow ecotones	3,000-6,200	No – project area is dry and above this elevational range
Giant hellborine *Epipactis gigantea*	Thermal or Perennial springs, boggy organ fens	2,000-5,750	No – project area is dry and above this elevational range
English sundew *Drosera anglica*	Bogs	3,000-9,000	No - requisite habitat features not in project area
Beaked spikerush *(Eleocharis rostellata)*	Bogs	2,700-6,100	No – project area is above this elevational range; requisite habitat features not in project area
Slender cottongrass *Eriophorum gracile*	Peatland (fen) species	3,000-7,600	No - requisite habitat features not in project area
Hiker's gentian *Gentianopsis simplex*	Mountain bogs, meadows, seeps	4,400-8,400	No - requisite habitat features not in project area, site is too dry
N. rattlesnake plantain *Goodyera repens*	Open mossy forests, mountains on north slopes, limestone, shale	5,700-6,800	Yes – Surveyed for this species but not found
Discoid goldenweed *Haplopappus macronema*	Rocky, open or sparsely wooded slopes, talus, above timberline	7,640 +	No – project area is well below this elevational range
Hall's rush *Juncus hallii*	Moist to dry meadows and slopes, montane	6,900-8,400	Yes – Surveyed for this species but not found.
Dwarf purple monkeyflower *Mimulus nanus*	Dry gravelly or sandy areas with sparse grass or sagebrush;	6,565 (Horse Butte along	Yes – Surveyed for this species but not found

Plants	Habitat	Elevation (in feet)	Potential Habitat Available? Species Present?
	prefers minimal competition	sandy bluff is preferred location)	
Austin's knotweed *Polygonum douglasii*	Open, gravelly, shale soils with eroding slopes and banks in montane	5,800-6,600	No - requisite habitat features not in project area
Barratt willow *Salix barrattiana*	Cold, moist soil near or above timberline	6,800-10,500	No – soils are well-drained and project area is below this elevational range.
Shoshonea *Shoshonea pulvinata*	Open, windswept limestone outcrops, ridgetops	6,800-9,000	No - requisite habitat features not in project area and project area is below this elevational range.
Alpine meadowrue *Thalictrum alpinum*	On hummocks w/shrubs in moist, alkaline meadows in montane, subalpine	6,500-7,000	Yes – Surveyed for this species but not found, site is too dry
Calif. False hellborine *Veratrum californicum*	Wet meadows and streambanks in montane and subalpine, alpine. Meadows, spruce, Doug fir	5,000-8,500	Yes – Surveyed for this species but not found, site is too dry

Methodology for Analysis

The analysis area includes the perimeter of the South Fork and Watkins Creek Allotments. For the South Fork Allotment a sensitive plant survey was conduct in 2008 and no sensitive plants were found. For Watkins Creek Allotment, the survey was conducted in 2000 and no sensitive plants were found. Slender paintbrush (*Castilleja gracillima*) and Joves buttercup *(Ranunculus jovis)* were listed as a sensitive plants at the time of the survey, but were removed because they are widely distributed. The survey emphasized plants that were likely to be found in the area based on habitat elevation and proximity to other known populations.

Direct and Indirect Effects

Since the sensitive plants are not found on the allotments, it is very likely they do not occur. Consequently, there are no direct or indirect effects to consider and therefore no cumulative effects analysis is applicable.

A.7 Suitability and Capacity

Issue – The comments from the public indicated there was a concern regarding the lands suitability for livestock grazing and there was a need to determine the grazing capacity of the site.

Indicator - Land was considered suitable for grazing by addressing six factors that are outlined in the Northern Region, Forest Service Range Analysis Handbook 2209.21 for suitability analysis. To calculate the capacity level for these allotments, forage production was determined and then compared to the proposed number of Animal Unit Months. To check the forage estimates for feasibility or reasonableness, the past utilization monitoring data was reviewed.

Suitability Analysis Methodology–

The suitability analysis for these allotments included the six factors that need to be considered when determining if land is suitable for livestock grazing as outlined in the Forest Service Range Analysis Handbook (2209.21 – section 263):

1. Forage productivity – area needed to be able to produce at least 50 lbs / ac dry weight. For this project, the areas needed to produce at least 200 lbs/ac to be considered suitable for livestock grazing.

2. Soil stability – is the soil easily erodible based on soil texture and depth. Shallow soils have low productivity and are difficult to maintain protective plant cover. Grazing on sandy soils may bury plants and expose root. Extremely fine textured soils may compact easily and lower water infiltration capacity. For this analysis the land type description in Soil Survey of Gallatin National Forest was used to determine unstable soils.

3. Current erosion – does the area show signs of erosion. For this analysis, a field review of the current condition determined if signs of erosion existed (looked for pedestals, terraces, rills or gullies).

4. Physical Barriers – is the area accessible to livestock (free of bogs, down trees, or heavy brush). For this analysis aerial imagery was used to delineate areas unsuitable for grazing due to physical barriers. These areas function like natural fences and help to confine livestock.

5. Slope – does the area contain steep slopes? For this project, slopes less than 30 percent were considered suitable for grazing.

6. Distance to water – is water available within 2 miles on level ground. For this project, all primary range was within 1 mile of accessible water.

The suitability analysis for Watkins and South Fork grazing allotments addressed the six factors listed above in a narrative description for each allotment.

In addition to the suitability analysis, a landscape level analysis described the different vegetation types within the project area (this type of information / analysis was requested by the public during scoping). Data from the Forest Service vegetation data base (TSMRS – Timber Stand Resource Management

System) was summarized to describe the number of acres of vegetation types on the west side of Hebgen Lake. The TSMRS data was derived from aerial photo interpretations. Vegetation types were delineated based on similar appearances, aspects, and patches needed to be greater than 5 acres. If the forest canopy cover was less than ten percent, the area was assigned a non-forest code (e.g., willow, sagebrush, meadow, grassland, water, rock). Approximately 10 percent of all vegetation types were verified with ground surveys in the late 1980s and early 1990s. Although this information is 30 years old, it is still useful for a general description of vegetation types because this area has not experienced a recent large disturbance (such as a wild fire or high mortality from insects). The analysis area followed the ridgeline along Lionhead and Coffin Mountains to the west side of Hebgen Lake.

Grazing Capacity Analysis Methodology

To analyze the grazing capacity for these allotments; the primary and secondary range lands were delineated on 2009 NAIP imagery based on knowledge gained from field experience. To be considered as feasible range land, all areas needed to be within one mile of water, less than 30 percent slope, and produce more than 200 pounds forage by dry weight per acres (same constraints used in the suitability analysis). To estimate forage production, areas with primary and secondary range were divided into ecological land type based on The Soil Survey of the Gallatin National Forest (Davis, C.E. and H. Shovic, 1996). Each land type has an estimated average for total forage production based on sites with similar soils and geographic locations. The lower forage production rate was used to account for annual variation and to create a more conservative estimate. To make the forage estimate even more conservative, transitional rangelands (those created from old harvest units) were not included in this analysis, because forage production decreases over time as the trees out-compete the grass/forbs.

Since total forage production includes all forage, with varying degrees of palatability, the utilization monitoring data was used to check to see if the estimates are reasonable for the amount of use that has occurred on the land over the past 20 years.

Suitability analysis - For an area to be considered suitable for livestock grazing, the FS Region 1 Range Handbook outlined six factors to consider. The table below describes the site conditions for each allotment. Based on the suitability review (see table below) this landscape does not have resource conditions which indicate it is un-suitable for livestock grazing.

Table A-4 Grazing Suitability Summary

	South Fork Allotment	**Watkins Creek Allotment**
1. Forage Productivity	Contains 141 acres that are capable of producing more than 200 lbs/ac forage (see capability analysis below)	Contains 493 acres that are capable of producing more than 200 lbs/ac forage (see capability analysis below)
2. Soil Stability	Soils in the South Fork Allotment are very deep and include a high percentage of poorly or very poorly drained soils. Coarse textures and	"Overall, soils in the Watkins Creek Allotment are quite resistant to impacts from cattle grazing, especially soil compaction ." (Keck,

	South Fork Allotment	**Watkins Creek Allotment**
	abundant rock fragments in the soil limit cattle grazing impacts despite the presence of wet soils. This area also benefits from low stocking rates.(Keck, 2011)	2011)
3. Current Erosion	No sign of active erosion, a few old pedestals, no terraces, rills or gullies. North pasture has a small pond that is naturally drained and flows toward South Fork River. Area appears stable and no active cutting or erosion. South Pasture has a ditch that was artificially created (stream diverted into man-made pond on private land, and a ditch dug through the south end of the pasture with a machine)	No sign of active erosion, no pedestals, terraces, rills or gullies.
4. Physical Barriers	Pastures are fenced with barbed wire drop down fence. South Fork River forms a boundary along the east edge on the Allotment	Watkins pasture is either fences or natural barriers (dense forest vegetation) that define the boundaries. Upper Watkins pasture is adjacent to fenced private land along the north boundary. Steeper forested slopes form the boundary along the other boundaries. Watkins and Wally McClure creeks have dense forests the form natural barriers.
5. Slope -	Most of the range land is on level ground. Small and isolated areas have gentle slopes less than 30 %	Primary grazing pastures are on level ground. Small and isolated areas have gentle slopes less than 30 %
6. Distance to Water –on level ground pastures need to be within 2.5 miles of water	All pastures are within 1 mile of water	All pastures are within 1 mile of water

Landscape vegetation types for the west side of Hebgen Lake- A brief overview of the vegetation types adjacent to the allotments (on the west side of Hebgen Lake from Hebgen Dam south to Highway 20, east of the main mountain ridge system running from Hebgen dam to the Continental Divide) is

provided in Table A-5 This area is predominately forested (73.6 percent) with small meadows in the valley bottoms (21.7 percent) and near the mountain ridges (1.2 percent). Of the 2992 acres in sagebrush, moist meadows and dry grasslands on the West side of the Hebgen Lake; the South Fork and Watkins Creek Allotments impact 634 acres, or 21 percent. That leaves 79 percent of the meadow / grassland vegetation types in this area not impacted by livestock grazing.

Table A-5 – Vegetation types on the west side of Hebgen Lake. Map is in project file

General Vegetation Categories	**Vegetation Type**	**Acres**	**Percent**
Non-Forested (FS Land only)	Willow	125	0.4
	Sagebrush	285	0.9
	Moist meadow / grassland	1198	3.7
	Dry meadow / grassland	1509	4.7
	High elevation rocky grass	378	1.2
	Rock, Cliff, Avalanche chutes	7848	2.4
	Lakes	275	0.8
Forested	Douglas-fir	5390	16.8
	Lodgepole pine	10427	32.6
	Subalpine fir	4390	13.7
	Quaking Aspen	211	0.6
	Whitebark Pine	3159	9.9
Private Land		3964	12.4
Total		31999	99.9

Grazing Capacity Analysis – Production rates for both allotments were estimated using the method described in the analysis method section above. The tables below show the following:

(1) The average amount of total forage for each pasture, for each Allotment (Tables A-6 and A-9);
(2) The number of days each pasture could support the current number of livestock permitted at different utilization rates (Tables A-7 and A-10); and,
(3) Summarize past utilization data (at full stocking level) to see if estimated capacity is similar to previous experience (Tables A-8 and A-11).

South Fork Allotment – Since 1982 up to the present this allotment has been managed with a three pasture deferred rotation grazing system. The current stocking rate is 15 cow / calf pairs, from July 1 to September 30 (92 days) for 46 cow/calf months (head months)[1] which is equivalent to 61 Animal Unit Months (AUMs)[2].

[1] Head months are the number of days permitted for grazing divided by 30 (average number of days in a month) times the number of head (cow /calf pair counts as one head) = 92 day/30 = 3.06 X 15 cc = 46 head months.

[2] The Animal Unit Month (AUM) takes the head month and adjusts that value for the amount of forage typically consumed by one cow (without a calf) for one month. The conversion rate used for a cow/calf month (head month) to an AUM is 1.32, according to the Forest Service Region 1 Range Analysis Handbook. Therefore, 46 head month X 1.32(standard conversion rate) = 61 AUM (Animal Unit Months).

Table A-6 shows an average estimate of total forage production for each pasture using the process described in the analysis method section above.

Table A-6 – Estimated South Fork Allotment total forage production based on landtypes (Shovic, 1996) and acres of suitable grazing.

Name	Acres	Land Type*	Lbs/ac dry weight	Total Lbs
North	40	34-1b	1410	56,400
Middle	47 6 16	34-1b 34-1b 66-1a	1410 1410 3400	66,270 8,460 54,400 129,130
South	21 11	66-1a 34-1b	3400 1410	68000 15510 83,510
Total	141			269,040

* The Soil Survey of the Gallatin National Forest (Davis, C.E. and H. Shovic, 1996) p. 31, 32, 79, 80.

Table A-7 displays an estimate of the number of days each pasture could support 15 cow/calf pair at different utilization rates. According to the Forest Service Region 1 Range Analysis Handbook, one cow/ calf pair consumes 34 lbs dry weight per day. To be conservative in the estimate of forage used, 35 lbs/day was used. Alternative 4 would allow for steers or horses to be grazed. If steers were grazed in this allotment they consume 39 lbs per day, and horses or mules consume 31 lbs per day. All scenarios would still fall within the carrying capacity. [3]

Table A-7 –South Fork utilization scenarios for the number of forage days for 15 cow/calf pairs

Pasture	Total forage lbs	Forage at different Utilization levels	#lbs/35 lbs for cc / 15cc = #days
North	56,400	55%- 31,020 lbs 35%- 19,740 lbs 25%- 14,100 lbs	31,020 lbs/ 35 lbs for cc daily / 15 cc = 59 days 19,740 / 35 / 15 = 37 days 14,100 / 35/ 15 = 26 days
Middle	129,130	55%- 71,021 lbs 35%- 45,195 lbs 25%- 32,282 lbs	71,021 /35 / 15 = 135 days 45,195 / 35 / 15 = 86 days 32,282 / 35 / 15 = 61 days
South	83,510	55%- 45,930 lbs 35%- 29,228 lbs 25%- 21,224.0 lbs	45,930 /35 / 15 =87 days 29,713.6 /35 /15 = 55 days 21,224 /35 / 15 = 39 days

In conclusion, even though the usable forage is less than the estimated total forage, the currently permitted Animal Unit Months (AUMs) fall within this allotment's capacity to support the 15 cow/calf pairs for 92 days.[4]

Monitoring utilization results over the last four years indicates that the average utilization rates (at full stocking level) ranged from 12 to 34 percent by dry weight, which is within the acceptable level. The allowable utilization rate is 55% in the early summer, 45 % late summer, and 35% fall (as stated in the permit, and consistent with the Forest Plan page III-20). Based on calculations above in Table A-7 and on

[3] Using the same calculation process used in Table 7, the capacity scenario for 15 steers would be at 115 days at the 25% utilization level.
[4] Table 7 scenario indicates a capacity for 15 cow/calf pairs for 126 days (26+61+39) which the currently permitted stocking falls within.

utilization data listed below in Table A-8, this allotment is capable of supporting the currently permitted AUMs based on 15 cow/calf pairs for 92 days at the allowable utilization levels in an average precipitation year.

Table A-8 – South Fork summary from monitoring notes, at full stocking level (copy of notes in project file)

Year	Pasture	Comments
2010	Middle	18% average utilization by weight, range 12-24 %, 4 transects with 50 plots each, stubble height 2-8 inches, average 4 inches
	North	34 % average utilization by weight, range 10-50 %, 4 transects with 50 plots each, stubble height 1-8 inches, average 3 inches
2009	North	15 % average utilization by weight, range 4 to 23 %, 4 transects with 50 plots each
	South	12 % average utilization by weight, range 8- 16 %, 1 transect with 50 plots, 4 days remaining on pasture, found 0.2 ac patch of yellow toadflax need to treat next year
2008	North	Walk through no sign of grazing (gate accidently left open)
	Middle	Walk through very little sign of grazing, cows spent most of the summer on private land
2007	North	28% utilization by weight, 1 transect with 50 plots
2002	Middle	35% utilization based on measured clipped plots, 31% based on ocular estimate, 6 inch stubble height
1996	North	68% average (60-76% range)
	South	24% average (20-26% range)
	Middle	33% average (18-36% range)
1995	North	40% average (15-55% range)
	South	53 % average (15-65% range)
	Middle	18% average (0-70% range)
1994	North	33% average (5-70% range)
	South	42% average (65-45% range)
	Middle	35% average (20-60% range)
1993	South	3% average (1-6 % range)
	Middle	20 % average (3-70% range)
1987	South	30 % average (18-54 % range)

Watkins Creek Allotment - From 1992 to the present time, this allotment has been managed with a two pasture deferred rotation grazing system. The current stocking rate is 55 cow / calf pairs, from July 1 to September 30 (92 days) for 168 cow/calf months (head months)[5] which is equivalent to 222 Animal Unit Months (AUMs).[6] Table A-9 show an average estimate of total forage production for each pasture using the process described in the analysis method section above.

Table A-9 –Estimated average total forage production rate based on landtypes (Shovic, 1996) and acres of suitable grazing.

Name	Acres	Land Type*	Lbs/ac dry weight	Total Lbs
Watkins	246	61-2a	1550	381,300
Upper Watkins	59	64-2a	1728	101,952

[5] Head months are the number of days permitted for grazing divided by 30 (average number of days in a month) times the number of head (cow /calf pair counts as one head) = 92 day/30 = 3.06 X 55 cc = 168 head months.

[6] The Animal Unit Month (AUM) takes the head month and adjusts that value for the amount of forage typically consumed by one cow (without a calf) for one month. The conversion rate used for a cow/calf month (head month) to an AUM is 1.32, according to the Forest Service Region 1 Range Analysis Handbook. Therefore, 168 head month X 1.32(standard conversion rate) = 222 AUM (Animal Unit Months).

Name	Acres	Land Type*	Lbs/ac dry weight	Total Lbs
	44	64-2a	1728	76,032
	40	34-4c	1820	72,800
	43	34-4c	500	21,500
	19	61-2a	1550	29,450
	35	34-4c	1820	63,700
	5	34-4c	1820	9,100
	2	34-4c	1820	3,640
	247 total			378,174 total
Total	493			759474

* The Soil Survey of the Gallatin National Forest (Davis, C.E. and H. Shovic, 1996) p.40, 41, 76, 77, 79, 80.

Table A-10 displays an estimate of the number of days each pasture could support 55 cow/calf pair at different utilization rates. According to the Forest Service Region 1 Range Analysis Handbook, one cow/ calf pair consumes 34 lbs dry weight per day. To be conservative in the estimate of forage used, 35 lbs/day was used. Alternative 4 would allow for steers or horses to be grazed. If steers were grazed in this allotment they consume 39 lbs per day, and horses or mules consume 31 lbs per day. All scenarios would still fall within the carrying capacity.[7] Likewise, Alternatives 3 and 4 would allow for an increase of 20 ac (30,060 lbs, which is not include in the table below) in the Upper Watkins pasture, which, at 25% utilization could add 4 days additional capacity to either the 55 cow/calf days or steer days.

Table A-10 – Different utilization rates and number of forage days for 55 cow/calf pairs

Current Pasture	Total lbs	Forage at different Utilization levels	#lbs/35 lbs for cc / 55 cc = #days
Watkins	381,300	55%- 209,715 lbs 35%- 133,455 lbs 25%- 95,325 lbs	209,715 lbs/ 35 lbs for cc daily / 55 cc = 108 days 133,455 / 35 / 55 = 69 days 95,325 / 35 / 55 = 49 days
Upper Watkins	378,174	55%- 207,995 lbs 35%- 132,360 lbs 25%- 94,543 lbs	207,995 /35 / 55 =108 days 132,360/35 /55 = 68 days 94,543/ 35 / 55 = 49 days

In conclusion, the currently permitted AUMs fall within this allotment's capacity to support the 55 cow/calf pairs for 92 days in a year with average precipitation.[8] This analysis did not include any of the transitory grazing pasture in the old harvest units along Wally McClure Creek Road because the trees are large enough to be competing with the forage, so this is a very conservative estimate.

Monitoring utilization results over the last four years indicated that the average utilization rates, at full stocking level, ranged from 20 to 40 percent by dry weight (there is a wide range of utilization, with the highest use next to the lake, at 75 % utilization). Based on the calculation above in Table A-10 and from the utilization data listed in Table A-11, this allotment is capable of supporting 55 cow/calf pairs for 92 days in a year with average precipitation.

[7] Using the same calculation process used in Table 10, the capacity scenario for 55 steers would be at 89 days at the 25% utilization level; 4 additional days capacity would be available under alternatives 3 and 4. This would place this steer scenario within currently permitted AUMs.
[8] Table 10 scenario indicates a capacity for 55 cow/calf pairs for 98 days (49+49) which the currently permitted stocking falls within.

Table A-11 – Watkins summary from monitoring notes, at full stocking level (copy of notes in project file)

Year	Pasture	Comments
2010	Upper Watkins	22% average utilization by weight, range 20 -25 %, 4 transects with 50 plots each
2009	Upper Watkins	24 % average utilization by weight, range 16 to 35 %, 4 transects with 50 plots each
	Watkins	20 % average utilization by weight, range 18- 26 %, 3 transects with 50 plots each, 13 days remaining on pasture, found houndstongue, spotted knapweed and thistle
2008	Watkins	40 % average utilization by weight, 70 % near the lake shore, 10 % rest of pasture, 2 transects with 50 plots each
2000	Watkins	35 % average utilization by weight, range 22 to 47 %, 3 transects with 50 plots each
1996	Upper Watkins Watkins	29% average utilization by weight, range 12-45%, 7 transects with 50 plots each 35 % average utilization by weight, range 20-72%, 13 transects with 50 plots each
1995	Upper Watkins Watkins	30 % average utilization by weight, range 20-35%, 8 transects with 50 plots each 45 % average utilization by weight, range 10-70%, 19 transects with 50 plots each
1994	Upper Watkins Watkins	50 % average utilization by weight, range 15-60%, 8 transects with 50 plots each 68 % average utilization by weight, range 5-75%, 16 transects with 50 plots each
1993	Upper Watkins	23 % average utilization by weight, range 16-35%, 10 transects with 50 plots each

A.8 Water Quality

Issue - There is a concern that livestock grazing would have impacts to streams in terms of water quality.

Indicator – Sediment loading as defined by the R1R4 sediment model will be used as an indicator of the effects of grazing.

Analysis Method –

The water quality analysis for the South Fork and Watkins Allotments consisted of multiple field trips to examine allotment water quality conditions. In addition the Montana DEQ CWAIC (Clean Water Information Center) was reviewed for water quality issues in the analysis area. Water qualiy consequences were determined via literature review of the project area, consultation with Montana DEA and PPL Montana (Pacific Power and Light), and sediment modeling results from the Lonesome Wood Vegetation Management Project.

Affected Environment –

The Watkins and South Fork allotments are well drained areas, with only a few localized areas which would be considered wetlands. The Montana Heritage Program, Natural Resources Information System, Montana State Library http://mtnhp.org/nwi/nwi_data.asp wetland map layer was developed for the Lonesome Wood project and is in the project file. The area west of Hebgen Reservoir includes freshwater emergent wetlands, freshwater forested/shrub wetlands, freshwater ponds, lakes, riparian emergent, and riparian forested – shrub and riverine wetlands. These wetlands consist of three general types: (1) lakes, (2) seeps and springs, and (3) streamside areas. A few small bogs in the area are classified as palustrine emergent wetlands. The seeps, springs, and streamside areas are classified as riverine, upper perennial wetlands (Cowardin, 1979). The seeps and springs are perennially saturated, while most of the streamside areas are only seasonally saturated (usually during snowmelt runoff). The largest concentration of wetlands in the area occurs along the shorelines of Hebgen Reservoir where the South Fork of the Madison River enters the reservoir. A large area of freshwater emergent wetlands (willow bottoms) on the South Fork Arm along the South Fork Madison River extends up to Highway 191. The South Fork Allotment has riverine wetlands along Basin Cabin Spring Creek and the shoreline of Hebgen Reservoir. An area of Hebgen Reservoir shoreline wetlands (freshwater forested/shrub wetlands) extend from Watkins Creek south to near Spring Creek Campground. The northern part of this unit is within the Watkins pasture along the shoreline of Hebgen Reservoir.

All of the streams in the assessment are designated by the Montana DEQ as B1 water quality streams. Watkins Creek is listed on the 2010 Montana DEQ 303d list http://cwaic.mt.gov/query.aspx as an impaired stream segment (7.1 miles from the headwaters to Hebgen Reservoir). However Watkins Creek no longer has pollutant related use impairment per the Montana DEQ 305(b)/303(d) list since siltation from logging activities is no longer listed as an impairment cause. Watkins Creek is now listed as fully supporting agricultural, drinking water and industrial uses. The stream does not support aquatic life, cold water fishery, and primary contact recreation due to low flow alterations below the National Forest boundary. In the Montana DEQ 303(d) inventory for Watkins Creek the Water Quality Category is now shown as TC – TMDLs are not required; no pollutant-related use impairment identified.

Direct and Indirect effects -

The water quality issue is eliminated from detailed analysis since effects are very minor with very little differences between Alternatives 1-4. Livestock impacts to streamside areas are minor and localized in both the Watkins and South Fork allotments as discussed in the stream form and function issue in Chapter 3.

Sedimentation

The Lonesome Wood2 Vegetation Management EA includes sediment modeling of the fuels treatments. The preferred alternative disclosed no sediment increases to Watkins Creek or Basin Cabin Spring Creek since no fuels treatments are proposed which would increase sediment in the Watkins Creek and Basin Cabin Spring Creek drainages. Watkins Creek has an R1R4 modeled sediment level of 1.9 % over natural which is well within Gallatin NF sediment standards of 30% over natural for streams that flow into Hebgen Reservoir.

Table A-12. Sediment yield effects for Watkins Creek, AMP Alternative 2, Current Management

Year	Natural sediment tons/year	Fuel treatment sediment tons/year	Road sediment tons/year	Total sediment tons/year	Livestock sediment tons/year	% Over natural sediment
2010	122	0	2.3	124.32	0.02	1.90
2011	122	0	2.3	124.32	0.02	1.90
2012	122	0	2.3	124.32	0.02	1.90
2013	122	0	2.3	124.32	0.02	1.90
2014	122	0	2.3	124.32	0.02	1.90
2015	122	0	2.3	124.32	0.02	1.90
2016	122	0	2.3	124.32	0.02	1.90
2017	122	0	2.3	124.32	0.02	1.90

Table A-13. , Sediment yield effects for Watkins Creek Allotment Alternatives 1, 3 and 4, and all Lonesome Wood 2 Project fuel reduction alternatives.

Year	Natural sediment tons/year	Fuel treatment sediment tons/year	Road sediment tons/year	Total sediment tons/year	Livestock sediment tons/year	% Over natural sediment
2010	122	0	2.3	124.32	0.02	1.90
2011	122	0	2.3	124.3	0	1.89
2012	122	0	2.3	124.3	0	1.89
2013	122	0	2.3	124.3	0	1.89
2014	122	0	2.3	124.3	0	1.89
2015	122	0	2.3	124.3	0	1.89
2016	122	0	2.3	124.3	0	1.89
2017	122	0	2.3	124.3	0	1.89

The main sediment change in the alternatives would be due to mitigation of localized sediment impacts to Watkins Creek at the cattle crossing (hardening west shore line with gravel) in the lower part of the Upper Pasture in T12S R3E NES13 which is estimated to result in approximately 0.02 tons of sediment discharge to Watkins Creek per year. Alternatives 3 and 4 includes hardening the crossing with pit run coarse gravel and exclusion fencing the adjacent riparian area from grazing which should virtually

eliminate livestock caused sediment and water quality issues from Watkins Creek. Alternative 1 – No grazing, would also eliminated the impacts at this crossing.

Basin Cabin Spring Creek has a small amount of streamside grazing with only very localized and minor observed sediment impact areas on the stream. Sediment effects from Alternatives 1-4 are very similar for Basin Cabin Creek. The no grazing alternative would eliminate cattle grazing from the pasture entirely while the Alternatives 3 and 4 utilize riparian monitoring to evaluate a need for reduction in livestock grazing intensity (refer to stream form and function analysis in Chapter 3 for more information).

Nutrients/Algae Blooms

Nutrient input to Watkins Creek, Basin Cabin Creek, and to Hegben Reservoir from the cattle grazing is similar to sediment effects and expected to be low since cattle have limited exposure to the stream and reservoir. Cumulative contribution effects of both sediment and nutrients from the two allotments are very minor and immeasurable.

Hebgen Reservoir has had periodic algal blooms (PPL, USFS, Gallatin Health Department, and MT DEQ, 2006). Outbreaks of toxic algae in Hebgen Lake have been reported in 1977, 1985, 1986, 1987, and 1988 but have diminished in recent years. The most intense algae outbreaks occurred in the Grayling Arm which is shallow, warmer, and has reduced circulation from the main body of the reservoir. Several cattle and pets died after drinking lake water particularly in the Grayling Arm during the 1977 bloom. The responsible organism for production of the toxic material in Hebgen Reservoir is probably the blue-green alga *Anabaena flos-aquae* although other potentially toxic forming algal species are present: *Aphanizomenon sp*., *Microcystis sp*., and *Lyngbya sp*. Picket (personal correspondence, 2010) indicates that the source of much of the algae blooms is from lake sediments mobilized during spring turnover. Wave action can concentrate algae along the lake shoreline which during warm weather can break down the algae and release toxins along the shoreline if the toxic forming algal species are present.

The environmental conditions that produce the toxins resulting from algae are unknown. Picket (personal correspondence, 2010) indicates that Hebgen Reservoir is a naturally system with a robust inflow of nutrients (nitrogen and phosphorous) from the upstream Yellowstone National Park (with numerous nutrient rich geothermal areas). During the time of the most active blooms (1977 to mid 1980's) sewage treatment lagoons at Madison Junction in Yellowstone National Park was likely an additional nutrient contributor. In order to limit risk to the public, livestock, and wildlife, a cooperative program between PPL, US Forest Service, Gallatin Health Department, and MT Department of Environmental Quality has been ongoing since 2000 consisting of weekly monitoring of Hebgen Reservoir (late May to the end of August) and public notification if concentrations of algae are found on the shoreline. A map showing sites of informational signs is in the project file, doc.#H-2.

The monitoring program satisfies the requirement for a Toxic Algae Monitoring Program that is required by the Section 401 Water Quality Certificate that is part of the Federal Energy Regulatory Commission (FERC) License for PPL Montana's Missouri-Madison Hydroelectric Project FERC No. 2188 (Order Issuing New License September 27, 2000).

This program is composed of two parts; Monitoring Plan and Action Plan. The Monitoring Plan covers annual sampling activities. The Action Plan describes activities that will be taken to educate the public and protect public health, livestock, and wildlife during a toxic event. The Action Plan is composed of three stages; (1) Information and Education, (2) Response, and (3) Closure of affected areas.

Picket (personal correspondence, 2010) indicated that the relatively small number of cattle in the South Fork and Watkins Creek Allotments and the small number of nutrient sources on the western shore of Hebgen Reservoir are only a very small source of potential nutrient inputs to Hebgen Reservoir and not significant.

Cumulative Effects –

Spatial and Temporal Boundaries: Cumulative effect boundaries included the entire Watkins Creek and Basin Cabin Spring Creek watershed and shoreline areas of Hebgen Reservoir adjacent to the Watkins pasture. Cumulative effects were considered from 1990 to 2017 to correspond to the R1R4 modeling for the Lonesome Wood project

Consistency with Laws, Regulations, and Policy -

The State of Montana Water Quality Act requires the state to protect, maintain, and improve the quality of water for a variety of beneficial uses. Section 75-5-101, MCA established water quality standards based on beneficial uses. The Montana Department of Environmental Quality has designated all of the streams in the South Fork and Watkins Creeks as B1 Classification http://www.deq.mt.gov/dir/Legal/Chapters/CH30-06.pdf. Waters classified as B1 must be suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. A 5 NTU turbidity increase above naturally occurring turbidity is allowed in B1 waters. The Montana water quality standards (ARM 17.30.602 (19)) define naturally occurring as “conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil, and water conservation practices have been applied”. The Montana water quality standards (ARM 17.30.602 (25)) define reasonable land, soil, and water conservation practices as “means, methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include but are not limited to structural and non-structural controls and operation and maintenance before, during, or after pollution producing activities.” http://www.deq.mt.gov/dir/Legal/Chapters/CH30-06.pdf These Montana water quality standards require the use of effective BMP’s so that water quality changes, if any, would be considered “naturally occurring”.

Sediment standards for streams in the South Fork and Watkins allotments area are listed in the Gallatin National Forest Travel Plan Standard M-1 for Water, Fisheries, and Aquatic Life**.** In watersheds with streams currently at or above fish habitat management objectives, proposals for road and trail construction, reconstruction and maintenance will be designed to not exceed annual sediment delivery levels in excess of those in Table A-14. Sixth-code Hydrologic Unit Codes (HUCs) are the analysis unit for sediment delivery (and other habitat parameters), except where a sixth code HUC artificially bisects a

watershed and is therefore inadequate for analysis of impacts to aquatic habitat and aquatic organism meta-populations. In such cases, appropriate larger units will be analyzed (e.g. 5th code HUCs). Within the analysis unit, sediment delivery values in Table A-14 will serve as guidelines; however, sediment delivery values denoted in individual 7th code HUCs may temporarily exceed sediment delivery rates denoted in Table A-14, in the following circumstances:

1. The HUC does not contain a fragmented sensitive or MIS fish population;
2. The majority of HUC's in the analysis unit remain within sediment delivery values listed in Table A-142;
3. Other core stream habitat (e.g. pool frequency, pool quality) or biotic (e.g. macro-invertebrates, fish populations) parameters within the HUC do not indicate impairment as defined by Montana Department of Environmental Quality (MDEQ); and
4. Sediment delivery levels will return to values listed in Table A-14 within 5 years of project completion.

Table A-14. Substrate sediment and sediment delivery by Forest stream category**.**

Category	Management Objective (% of reference*)	% Fine Substrate Sediment (<6.3mm)	Annual % > Reference** Sediment Delivery
A Sensitive Species and/or Blue Ribbon fisheries	90%	0 – 26 %	30%
B All other streams (formerly Classes B, C, D)	75%	0 – 30 %	50%

*% of reference = % similarity to mean reference condition; reference conditions range = X-Y
**Reference = observed relationship between substrate % fines and modeled sediment delivery in reference (fully functioning) GNF watersheds.

All streams within the project area including Watkins Creek and the South Fork of the Madison River are Category A streams (sediment levels of 30% reference) due to spawning habitat for Hebgen Reservoir.

Gallatin National Forest Plan standards that directly apply to South Fork/Watkins are on pages II-23 and 24 of the Gallatin Forest Plan and include:

Water and Soils:

- Best Management practices (BMP's) will be used on all Forest Watersheds in the planning and implementation of project activities.

- All management practices will be designed or modified as necessary to maintain land productivity and protect beneficial uses.

All of the streams in the South Fork and Watkins Creek Allotments area currently meet the Montana B-1 Classification standards. The South Fork and Watkins Creek Allotment Management Plan update project will maintain Clean Water Act standards compliance and protect beneficial uses. The State of Montana

Water Quality Act requires the state to protect, maintain, and improve the quality of water for a variety of beneficial uses. Section 75-5-101, MCA established water quality standards based on beneficial uses.

None of the streams in the Watkins Creek and South Fork Allotments area are 303(d) listed for sediment, nutrients, or other water quality parameters as none of the streams are listed by the Montana DEQ as requiring TMDL development. The Montana DEQ water quality standards definition of "naturally occurring" (ARM 17.30.602 (19)) allows some sediment and nutrient levels above natural providing "all reasonable land, soil, and water conservation practices have been applied" per ARM 16.20.603(11). The Watkins Creek and South Fork Allotments BMP's meet the definition of "all reasonable".

The Watkins Creek and South Fork Allotments would be in compliance with the Montana Water Quality Act and Administrative Rules of Montana, WQLS/TMDL constraints, and with Gallatin National Forest Plan direction for water quality protection. Sediment modeling indicates that cumulative sediment increases are immeasurable and well within the Gallatin National Forest sediment guidelines. Nutrient releases from cattle grazing are also minor and localized with no areas within the allotments having Montana DEQ identified use impairment.

The Gallatin National Forest sediment standards were revised during the Travel Plan process (in cooperation with the Montana DEQ) to be much more restrictive than previous standards and are based on sediment modeling and calibrated with actual Gallatin National Forest water quality data (instream suspended and bedload sediment), and sediment core (spawning substrate fines). This environmental analysis demonstrates that the South Fork and Watkins project is considerably below and well within compliance with the 30% over natural standard.

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative http://www.fema.gov/plan/ehp/ehplaws/eo11988.shtm#0.

In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities" for the following actions:

- acquiring, managing, and disposing of federal lands and facilities;
- providing federally-undertaken, financed, or assisted construction and improvements;
- conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities

The allotments do not modify the flood plains so this project is incompliance with this executive order.